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SOME ECONOMIC ASPECTS OF THE WORLD WAR[1]

ECONOMIC CONDITIONS BEFORE THE WAR[2]

Our Resources

THE United States is a nation of unmatched natural resources. It is a young nation. Its people have not yet multiplied so that they even approximate the potential possibilities of production. In consequence of this happy situation the United States, antecedent to the war, easily produced a sufficient amount of almost every essential commodity to meet our wants and in addition a large surplus. The production in the United States of the cereals—wheat, oats, rye, corn, and barley—was enormous. Whether the year was favorable or unfavorable, enough of each was produced not only for our own needs, but these commodities could be shipped abroad to any extent that the market demanded.

The situation in regard to meats and fats was like that which obtained for the cereals.

The only fundamental food of which we did not produce vastly more than we needed was sugar; and an adequate supply of this commodity was easily furnished by our insular possessions and by our immediately adjacent neighbor Cuba.

The two great textiles of the world are cotton and wool; and of these "cotton is king." Of the latter commodity the out-

[1] Address of Charles R. Van Hise as retiring president of the American Association for the Advancement of Science, Pittsburgh, Pennsylvania, December 28, 1917.

[2] For a much fuller presentation of the facts herein summarized see "Conservation and Regulation in the United States during the World War," by Charles R. Van Hise, published by the Food Administration.

put of the United States was more than twice that of the rest of the world; and wool was also produced in large quantities; but for this textile, we were both exporters and importers.

Of the most essential mineral products. we were leaders of the world. More iron ore and its products, iron and steel, were produced in the United States than by our two chief competitors combined—Great Britain and Germany.

Similarly the production of copper was more than half that of the world. For lead and zinc we led the world. The petroleum production again was more than half that of the world.

Fundamental to all industry is power; and power is mainly produced by coal and falling water. The coal production of the United States previous to the war was greater than that of Great Britain, Germany and France combined; and water power was developed on a more extensive scale than in any other country.

Also the forests of the United States originally surpassed those of any other country; indeed wood was so abundant that except in the cities we are a nation of wooden houses.

Finally the transportation system of the United States has developed far beyond that of any other country. The railroad mileage of the United States for 100,000,000 people is 40,000 miles greater than for Europe with 450,000,000 people; and, aside from Europe, is much greater than for the more than 1,000,000,000 people inhabiting all the rest of the world. Our transportational system furnished rapid movement of commodities at a lower rate than that of any other nation.

It is not so many years ago that the American people thought that all of their natural resources would last forever. It was frequently said that the deposits of iron ore, copper and petroleum are inexhaustible. While, before the war, we had developed beyond this simple primitive faith in our bigness, at least so far as scientific men were concerned, we still took it as a matter of course that each year there would be enough of every essential commodity—food, clothing, metals, oil, fuel—to meet without limitation any demands that might be made. While there might be local want in the cities, this was not due to lack of an insufficient quantity of essentials in the country, but to our imperfect economic system. Famine was unknown. From childhood the great majority of our people regarded an abundance of essential commodities as the natural order of our planet; whereas, those who consider the globe as a whole know that a considerable fraction of the people of the world go to bed each night, if not absolutely hungry, at least insufficiently nourished. From time to time, since the dawn of history and doubtless millenniums before, famine has swept over the densely populated portions of the earth carrying away the people by hundreds of thousands or by millions.

Control by Supply and Demand

Under the conditions of abundance in this country, we depended upon the law of supply and demand and competition to control the prices and distribution of commodities. Indeed these doctrines were a faith with both the great political parties, and without being formulated have been unquestioningly accepted by the people for a hundred years.

The Antitrust Laws.—When the period of concentration in industry came with modern transportation, and it become possible by combination and cooperation to control the market and thus unduly enhance prices, a remedy for the trusts was demanded by the people. Congress decided upon prohibition with penalties.

The Sherman antitrust law was enacted, which forbids all combinations and contracts in restraint of trade and monopoly. Similar laws were enacted by the states. Notwithstanding these laws, combination and cooperation continued; and a long series of suits have been brought by the Attorney General of the United States to enforce the Sherman law and dissolve unlawful trusts. But still cooperation existed everywhere, not by definite contracts, but by mutual understanding, so that in any given community the price for each standard commodity was the same. However, the representatives of the people did not surrender their faith that the remedy was to restore the freedom of trade; and in 1915 the Clayton antitrust act was passed, which attempted to bolster up the Sherman act by introducing the new restrictive principle that any combination which resulted in substantial lessening of competition was unlawful.

Thus antecedent to the war, so far as the control of production and distribution of commodities were concerned, we were mainly dependent upon the law of supply and demand with competition and upon repressive laws which should prevent cooperation and allow a free flow of trade.

Regulation Before the War

Regulation, however, had begun. It had become recognized that the public utilities occupied an exceptional position.

The Public Utilities.—All business and industry are so dependent upon transportation, and the public convenience was so interested in having good service without discrimination that, for the railroads and other public utilities, regulation had been adopted as a national policy through the enactment of the Interstate Commerce law and the various state public utilities laws. It is difficult to recall the bitter opposition which the proposal to regulate the public utilities aroused when it was first made. The owners of the stocks and bonds said the railroads were private property, in the control of which the public should have no part. These ideas bring a smile now; but the older men among us remember the fierce contest running through years, before it was established that the public had such an interest in the utilities as to require their regulation.

The Pure Food and Drug Acts.—At another point, it appeared that the laws of supply and demand and competition were not adequate to control commerce. It was the theory of those who held these doctrines in an extreme form that supply and demand and competition would result in securing quality, because poor goods or spurious goods could not compete with good materials. But, after the period of concentration came on, it was found as a matter of fact that food and drugs were extensively sold of inferior quality and even dangerous character under false names. After a prolonged contest, the pure food and drug laws were enacted by Congress and by the several states. The manufacturers of food and drugs denounced these regulatory measures as an interference with private business. It seems odd to us now that any one should consider it a right to sell a food or a drug under a false name. It seems even more strange that the right to sell diseased meats should be regarded as sacred. But this is so recent that probably all here remember the severe struggle to establish the principle that meat should be inspected and found wholesome before being placed upon the market.

During the contest for public control, those who advocated the regulation of the public utilities and foods and drugs were often denounced as socialists and were held up for opprobrium as being in favor of the

subversion of the fundamental principles of our government.

The Administrative Commissions.—As a necessary concomitant of these regulatory movements, commissions or other public agents were created whose duty it was to enforce the public utilities and pure food laws. At first the commissions had small authority; but as necessity arose their powers were expanded. When the present powers of these commissions and agents were worked out, it was found that they were a combination of executive, legislative and judicial; and, thus, instead of keeping these functions separate, they were combined. Regulatory commissions have now become recognized as essential under modern conditions as the executives, legislatures or courts. The development of the administrative commissions is probably the most fundamental change which has taken place in our government since the adoption of the Constitution. Therefore it is not at all surprising that the development of these commissions has been looked upon with suspicion and doubt by the people, in consequence of which it is only slowly and, as proven necessary by irresistible facts, that they have increased in numbers and expanded in functions.

The above is a wholly inadequate, because necessarily all too brief, summary of economic conditions which existed antecedent to the war.

THE EFFECT OF THE WORLD WAR

When the World War broke out in August, 1914, the immediate economic effect was to create almost a panic in this country. The stock exchanges in the chief commercial countries of the world were successively closed. Prices of many commodities fell. But it was not long before the permanent economic effect of the war began to appear.

The Greatly Increased Demand for Commodities

There were withdrawn from productive work by the allies alone 15,000,000 to 20,000,000 of men; and behind the lines as many more were ere long diverted to war manufactories. In consequence of the collosal transfer of the ranks of industry, there was a great decline in the agricultural and ordinary manufacturing production of Europe. Yet, the many millions of men in the field required more than the usual amounts of food and great quantities of clothing. The demand for ships, guns and munitions was insatiable. The result was an extraordinary call for essential commodities from the United States.

Increase in Exports

The amount of wheat which was exported in the fiscal year 1914–15 was more than double that of any previous year. The exportation of meats and fats rapidly increased until it became threefold.

The exports of iron and steel gradually increased until they became fourfold.

The exportation of copper increased twofold. Many other commodities were exported in proportion to those mentioned.

Thus while, from the outbreak of the war, the central powers were in a great measure cut off as export markets for the United States, the needs of the allies were so greatly enhanced as to vastly more than counteract the partial loss of the export market for the central powers.

Increase in Home Demands

Finally in April, 1917, we entered the war; and in consequence there were at once great governmental demands for materials to build ships, for munitions, for food, and for textiles. To meet these needs it was necessary greatly to extend our manufacturing, transportational, mining and

constructional facilities. Thus there arose a greatly increased home call for foods, for textiles, for metals, and for wood. Fundamental to all industry is energy. The energy derived from water can not be readily increased suddenly; and therefore the increased requirements must be met by coal. This particular demand came rather slowly; and it was not until the middle of the summer of 1916 that a shortage of coal appeared probable. From the middle of that year, the demand has exceeded the supply, and exerting every effort, for 1917–18, it is estimated that the supply will be 50,000,000 tons short of the needs, although the production has been largely increased.

Mounting Prices

It thus appears that, in consequence of the World War, we have an absolutely new situation in this country—one in which there is demanded more of every essential commodity than the country is able to supply. Because of this radically changed situation prices began to mount, rather slowly for most commodities until about July, 1915; but since that time for two years rapidly and at an accelerating rate. Prices at about the middle of 1917, as compared with those three years earlier, just before the outbreak of the war, for a number of the most important commodities, were roughly as follows:

Meat animals and meats, 25 to 75 per cent. higher.
Wheat and flour, two and one fourth times as much.
Corn and cornmeal, an increase of 80 per cent.
Potatoes, an increase of about 60 per cent.
Sugar, an increase of 75 per cent.
Cotton and cotton yarns, an increase of 75 per cent.
Wool and worsted, two and one third fold.
Bituminous coal, from two to threefold.
Copper, about two and one half fold.
Pig lead, about threefold.
Pig iron, about three and two thirds times as much.
Steel billets, more than fivefold.
Spelter, nearly double.
Petroleum, an increase of about 75 per cent.

The Causes of Mounting Prices.—The fundamental cause of the mounting prices is that which has already been explained, an unusual and extraordinary demand at first abroad and later at home for all essential commodities; but this has been only one factor in the process.

When it was generally appreciated that there was likely to be a shortage of the essential commodities, the home purchasers, instead of buying ordinary amounts, purchased in advance of their needs. Thus the family, instead of buying flour by the sack, bought a number of barrels; or, in some instances, bought flour for years ahead. The same was true for sugar. Similarly during the spring and summer of 1917, when it was appreciated that there was a shortage in coal, many manufacturers tried to protect their business by accumulating reserves to carry them through the winter. Many of those who required coal for heat did likewise.

The consequence of the unusual buying campaign was that the demands of purchasers were far beyond what would have been necessary to meet actual needs, had the ordinary procedure been followed. This frenzy of excessive buying greatly aggravated the situation.

Another important cause of the rising prices was that a time when there is an extraordinary demand is especially advantageous for speculators to accumulate larger stores of goods of various kinds and hold them for advances in prices. This

was done on a great scale throughout the country for every essential commodity.

Finally, when the conditions are set forth, it is especially easy for those in a given line of business to cooperate to push prices upward and thus greatly increase their profits. This also was done extensively for many commodities.

Based upon the first factor, the second, third and fourth factors have come in to accelerate advancing prices, each with reinforcing power. The tendencies above described, once started, are cumulative, and the enhancement of prices goes on with increasing velocity. The prices of foods are advanced; the employees must have higher pay because of the increased cost of food; the raw materials for manufactured articles are advanced; the manufacturer charges a higher price for his articles because he must pay more for his labor and an increased price for his raw materials. The jobber and the retailer did likewise. At each successive stage the advance of prices is made sufficient to cover the increased cost and an additional increment is placed on top. The cycle thus completed, is begun again with food, and the circle once more gone around. The second cycle completed, the conditions are right for a third cycle, and so on indefinitely, with the result that prices rose beyond all reason, like a spiral ascending to the sky.

Failure of Control by Supply and Demand

Under pre-war conditions, when the supply was equal to and often greater than the demand, the prices, if not adequately controlled, had been largely controlled by competition, except where there had been cooperation of purchasers or manipulators, or both, to control the market; but the facts presented show that under the war conditions the laws of supply and demand and competition adequately to control prices have broken down, for the simple reason that for every staple commodity the demand is ever greater than the supply.

It is not possible to give percentages of the extent to which the demand exceeds the supply for each commodity; but it is safe to say that the percentages upon the average are not large, probably not more than 20 per cent., and for scarcely any commodity more than 30 to 40 per cent. Thus for coal the demand for the current year over that of last year is 20 per cent., and the excess demand for this year over the production not to exceed 10 per cent.

However, the moderate excess demand, taken in connection with buying in advance of needs, of forestalling by speculators, and combination to control the market, has been sufficient to increase the prices of many essential commodities by 100, 200, 300, and even 400 per cent., and for certain articles greater amounts. It is therefore clear that there is no relation whatever between the excess demand and the increase of prices under the competitive system. An increase demand of one tenth or one fifth may increase prices two, four, or even five fold.

There is no reason to suppose that the excess demand will decrease in the near future; indeed it is probable that next year the demand for commodities will be greater than this year; and this situation of excess demand over the possible supply will almost certainly continue to the end of the war and possibly even longer. So long as the excess demand exists, if supply and demand are allowed to have full play, prices will continue to climb.

The situation above described in regard to an inadequate supply of essential commodities and their ever-increasing prices demonstrate that, under the war conditions, the laws of supply and demand and competition are insufficient to secure the neces-

sary increase in production, to control distribution, and to hold prices at proper levels. If the war is to be carried to a successful conclusion the production of the United States must be enormously increased. The distribution of the essential commodities must be such as to meet the various needs in proportion to their importance. The prices to the people of the United States and the Allies must be reasonable else extortion will continue on a vast scale both from ourselves and our associates; but the law of supply and demand and competition did none of these things—even the increase in production was inadequate.

REGULATORY MEASURES NECESSARY

To remedy the situation the President asked Congress for one regulatory measure after another. The crisis was such that these requests have all been met. The result is a most amazing series of regulatory enactments. These are as follows: The food and fuel administration act, the shipping act, the espionage act, the trading with the enemy act, and the priority act. Also the War Industries Board and the Federal Court have instituted regulatory measures without congressional action.

It is my purpose very briefly and inadequately to summarize some of the things which have been done under these regulatory measures and, following such summary, to discuss the principles involved. All of the measures enacted by Congress grant the powers to the President. These he has in some cases at first exercised, but later delegated them to agencies created as authorized by the acts. After such agents have been created, the President has issued proclamations from time to time in accordance with the recommendations of the several agencies. In the succeeding pages, for the sake of brevity, no discrimination is made between the exercise of the powers by the President directly and their exercise by his agents.

The Food Administration Act

Under the Food Administration Act, the President appointed Herbert Hoover, Food Administrator. The latter organized the Food Administration. A licensing system has been introduced for all essential food commodities. Manufacturers, wholesalers, and other distributors are required to take out a license in order to conduct their business. Under the terms of these licenses, hoarding and speculation are to be eliminated and only fair and reasonable profits or charges are to be made for services rendered. Thus the charge which the miller may make for the manufacture of flour and the margin which the jobber may take for its distribution is definitely limited.

The law confines the control of the Food Administration to the zone between the original producers, that is, the farmers and the farmers associations and the retailers with a business less than $100,000 per annum. The manufacturers and the wholesalers are directly reached by regulation; the farmers and retailers only indirectly. While the base price of the producer is not controlled, intermediate additions are, so that the product reaches the retailer with only a fair increment added to the price of the producer. The public is informed in regard to the price which the retailer pays and what would be a fair price which he should charge.

Scarcely less important than the regulation of prices is the control of distribution. The Food Administration decides upon the amount of the essential commodities which go abroad and to what country they are to go. Not only so, but he controls the home distribution, and if advisable, even to the extent of the purposes for

which the commodities are used and the amount.

The situation is well illustrated by the staples—sugar and wheat and its products.

Sugar.—For sugar the Food Administration has made agreements with the producers in regard to the prices which they are to receive; with the refiners concerning the prices they are to charge for their services; has limited the margins of the jobbers and wholesalers; and thus has controlled the price at which the commodity should be sold to the retailer. Also the Food Administration has indicated what would be a fair margin for the retailer. Thus the public knows precisely what it should pay for sugar in any locality. Further, the Food Administration has very sharply controlled the distribution of sugar, deciding absolutely the amount which is to go abroad, and has limited the amount of sugar to be used in certain industries, such as the bakers and the confectioners.

Wheat and Its Products.—For wheat the control has gone even farther. The price of wheat has been fixed for each grade at the primary central markets. To handle wheat a grain corporation has been formed, which organization has actually bought and sold wheat to the extent necessary to reach the required results. While only a small part of the wheat crop has been bought and sold by the grain corporation, the other larger part has been controlled as completely as if it were bought and sold; that is, the grain seller and the miller and exporter have been brought into direct relations. The wheat remains at home or is sent to our associates in war in accordance with the directions of the Food Administration. With few exceptions sales have been carried on at the prices fixed by the Food Administration, and thus the dealing in wheat is practically a government-controlled monopoly.

By limiting the charges of the miller, the price of flour at the mills is as definitely controlled as the price of wheat. The jobbers' margins are fixed and the freight rates are known. The bakers have been brought under licenses, which provide for a standard loaf, both in regard to its constituents and its weight. The price of this standard loaf is therefore definitely determined for the bakers in different parts of the country; and this gives a basis upon which to announce a fair charge by the retailers. This for a pound loaf is from 7 to 9 cents. Thus the price of bread, the staff of life, is brought under control.

In distributing the wheat, its main routes of travel have been very greatly changed. Under pre-war conditions the wheat very largely went to the great central markets and especially Chicago and St. Louis. The price of the wheat of the country was controlled by Chicago quotations; and this market, and to a lesser extent St. Louis, served as magnets which drew the wheat to these centers. From these centers it was redistributed. Under the Food Administration the importance of these centers has diminished; cross and return freights have been avoided. The wheat for export has very largely gone directly south to the Gulf ports and there found an outlet instead of East to the Atlantic ports. The wheat not exported has gone directly to the milling centers, in proportion to their capacity, there to be converted into flour.

Other Foods.—Other essential foods have been placed under the licensing system and thus to a large extent controlled, although as yet regulation has not gone to the extent of that for wheat and its products and sugar, but the Food Administration is moving from one essential commodity to another. Thus the first step in the control of the price of meat—the limitation

of the profits of the packers—has been taken.

As a result of the work of the Food Administration the skyward movement of prices has been checked, and for some of the most essential commodities such as wheat, the product of wheat flour, and bread, there have been actual reductions in price. Also prices have been stabilized. Dealing in futures for the most essential products has been prohibited and hoarding and speculation prevented.

The Fuel Administration Law

One section of the Food Administration act authorized the control of fuel. Under this section the President appointed H. A. Garfield Fuel Administrator. The maximum price of each kind of coal and coke at its source has been fixed. Moreover, the margins which are allowed to the jobbers and to the retailers have been limited, and thus the price of coal to the consumer has been controlled. Therefore for coal, the price control occupies the full field rather than the zone between the producer and the retailer as in the case of wheat.

The Fuel Administration has also controlled wage contracts with the miners. When a considerable advance of wages was approved, it was made a part of the contract that the miners should be penalized $1 a day if they declined to work or ceased to work during the time the contracts into which they had entered remained in force.

The distribution of coal and coke has been controlled as completely as the price. The coal has gone for the purposes and to the various districts in accordance with the decisions of the Fuel Administration. The amount of coal which goes abroad is also controlled. Thus the amount assigned to Canada is the quantity received last year plus the same percentage of increase as that obtained by the United States.

The prices have not been fixed exclusively upon the basis of the heating power and the location of the coal, but in part upon the basis of the cost of production. In many instances this gives the poorer mine which is unfavorably located a higher price per thermal unit than the rich mine favorably located. This practise is in complete contravention to economic theories accepted before the war. The owner of a better property gained all the advantages of cheapness of operation and convenience of transportation.

Had the Fuel Administration so decided, it would have been possible under the law for the government to become the exclusive buyer and seller of the coal for the country. Had this method been used, the coal mined would have been sold to the Fuel Administrator by the operator at a fair profit. The coal then his property would have been pooled and sold at prices dependent upon its value, taking into account its thermal power and other qualities and its position in the country in regard to freight. The prices fixed would have been sufficient to cover its cost, including that of administration.

The Shipping Board and Emergency Fleet Corporation Boards

The United States Shipping Board has requisitioned all cargo ships and tankers registered under the laws of the United States of not less than 2,500 tons total dead weight capacity, and all passenger steamers of not less than 2,500 tons gross register. These vessels, thus requisitioned, have in general been leased to the companies which before have been operating them, the companies receiving a definite compensation based, for freight boats, upon dead weight ton capacity, and for passenger vessels upon the number of passengers which they can carry. The vesesls are to sail on routes and

carry goods as determined by the Shipping Board.

The Shipping Board also exercises the control of interstate commerce by water, its powers being analogous for water transportation to those which have been exercised by the Interstate Commerce Commission in regard to railroads. However, the powers of the Shipping Board extend beyond those of the Interstate Commerce Commission in that the board is allowed to approve any agreement between common carriers by water concerning rates, accommodations, pooling, limited sailings, and other arrangements; and all agreements thus approved by the board are exempt from the Sherman antitrust law and its amendments.

Under the Shipping Board, there has been organized the Emergency Fleet Corporation with a capital stock of $50,000,000. This corporation has requisitioned all the shipyards of the United States and all the ships under construction. The ships will be completed in accordance with the directions of the Fleet Corporation. The actual operation of the yards and the finishing of the ships remain with the corporations and persons who previously had them in charge, but the compensation which they are to receive is upon the basis of a fair profit, which is decided by the Fleet Corporation.

The Fleet Corporation is also engaged on a gigantic scale in the construction of additional ship-building plants and in the construction of new ships. This work is largely done not by the Fleet Corporation itself, but under contract. The Emergency Fleet Corporation has announced that the actual building program under contract embraces more than 8,000,000 tons, dead weight capacity.

Charles R. Van Hise
University of Wisconsin

(*To be continued*)

THE NOMENCLATURE USED IN COLLOID CHEMISTRY. A PLEA FOR REFORM

Colloid chemistry is no longer considered as a mere collection of mysterious substances and "abnormal" reactions. It is an important branch of chemical and physical science possessing a fairly well established working basis and is rapidly acquiring new students.

It suffers, however, like all virgin sciences, the affliction of superfluity of terms used to describe essentially the same things, careless and loose use of some expressions, and confusion of nomenclature in general. This condition results in a great handicap to new students. It is very difficult for them to acquire clear conceptions from their first readings of the various works on the subject.

It is time that this matter be taken in hand by some committee of our Chemical Society for the purpose of removing this needless handicap and confusion by defining the various terms used in colloid science, eliminating unnecessary ones and by standardization of the terminology in general, just as was done with the terminology of the proteins by the biological chemists some years ago.

The paragraphs which follow attempt to point out some of the cases of malusage of terms.

No objection can be raised against the word "colloid." It is distinctive, but the use of the expression "colloidal *solution*" is to be strongly condemned, since it is so evident that substances in the colloidal condition are not dissolved, in the strict sense of the term. Colloidal particles are in a condition midway between solution and mechanical suspension, and they are held in this peculiar state of *dispersion* by virtue of their surface energy, electrical charge, their kinetic energy as manifested by the Brownian movement, and the adsorbed ions of electrolytes which are essential to the stability of all colloids.

The general term "dispersion," as suggested by Wo. Ostwald, is to be preferred to the special term "solution." *E.g.*,

"Mechanical suspensions" are	Coarse dispersions,

"Colloidal solutions" are Colloidal dispersions, and
"True solutions" are Molecular dispersions.

The particles, or "internal phase" of these systems are known as the "dispersed phase," and the liquid in which they are dispersed, the external phase, is known as the "dispersion medium."

The present usage of the word "sol" and of its modifications—"hydrosol," "alcosol," etc., to describe a colloidal dispersion, is the same as that of Graham, their originator. I have noticed, however, that the word "sol" has been used by a few writers in the sense of the dispersed phase, *i. e.*, the particles in colloidal dispersion. Is this use of the term to be permitted? Graham invented it as a short and convenient substitute for colloidal "solution" and a perusal of the works by Bechhold, Cassuto, Freundlich, Hatchek, Ostwald, Taylor and Zsigmondy shows that the original sense of the expression has been retained by these writers.

The use of the term "gel," however, and of its modifications, "hydrogel," "alcogel," etc., is deplorably loose and confusing. This term was coined by Graham[1] and first used by him in discussing the "pectization" or coagulation of the hydrosol of silicic acid. Therefore, if we are to limit the use of "gel" to its original sense, we should use it only when speaking of the definite *coagula* of sols. This is not the case, however. Any substance which resembles a jelly in appearance is called "gel," although in chemical and physical properties it may be entirely different from the kind of matter which Graham had in mind when he invented the term. This use of the expression is exceedingly popular and would be very difficult to overcome.

Let us take up a case or two to show how unscientific this latter usage of the term is. For example, consider the dissolution or dispersion of gelatine in hot water. It forms a very mobile "solution" or rather dispersion, and in this form is called a hydrosol or sol. If this hydrosol be allowed to cool, it becomes very viscous and "sets" to a jelly-like mass. In this stiffened form it is popularly known as a "hydrogel" or "gel." If it be warmed again, its viscosity decreases, it becomes mobile and is called a "sol." Now if this use of the term "gel" (which is not as Graham intended) is to be permitted, then what is the line of demarcation between the sol and gel states? A change in state has occurred, it is true, for in the sol condition the water was the external phase whereas in the so-called gel state the gelatine became the external phase and the water internal. The change is very gradual, however, and our change of terms to suit the change in appearance of the system is exceedingly arbitrary and unscientific. Furthermore no chemical change in the nature of the gelatine has taken place.

If some alum or a trace of mercuric chloride be added to the gelatine hydrosol, a coagulum is obtained which is correctly termed a gel according to Graham. This is a coagulated compound, however, a chemical reaction has taken place. It will not redissolve in water and is, therefore, entirely different from the case discussed above, which is also commonly called gel.

To further complicate matters, the dry pieces of gelatine (and in fact any other colloid which will "dissolve" readily) which were used to make the original sol are also quite commonly called "gel." Lottermoser called attention to this several years ago and suggested that such pieces of gelatine, or of any other dry "soluble" colloid be called "solid sol." This suggestion is obviously bad. Why apply any special term at all?

When a hydrous ferric oxide sol is allowed to evaporate spontaneously, it will go through a jelly-like stage and finally become a hard scaly residue when all or nearly all of the water has left it. The jelly-like form will redisperse when warmed with an excess of water, while the amorphous form will not. Yet both forms are called "gel"! Zsigmondy distingishes between these two different forms by calling the first one "hydrogel" and the second, "gel."

[1] *Proc. Roy. Soc.*, 13, 337 (1864).

A review of the texts on colloidal chemistry shows the following conceptions of this term.

Cassuto[2] calls a gel the gelatinous precipitate obtained from a sol by means of an electrolyte, heat or evaporation. *I. e.*, a gel is formed by coagulation of a sol. He calls stiffened sols (or jellies), "gelatines."

Bechhold[3] remarks the loose use of the word "gel" and states that he restricts it to the description of the coagula from sols. To the stiffened sols or jellies he applies the term "Gallerte," which in English might be called "jelly."

Freundlich[4] says that systems of solid dispersion media and liquid dispersed phase are gels as distinguished from the reverse which are suspensions or emulsions. In other words he applies the word "gel" to jellies.

Hatschek[5] refers to the fact that Graham applied the name "gels" to the products obtained by the coagulation of sols, but later on in his book he calls jellies, gels also.

Ostwald in his "Handbook of Colloid Chemistry," considers all colloids as gels when the system becomes "microscopically heterogeneous." That is to say, he applies the term promiscuously.

Taylor[6] uses "gel" in the same loose general manner as Ostwald, Hatschek and Freundlich.

Zsigmondy in his "Kolloidchemie," limits the word "gel" to the dry residue which will not redisperse in a solvent, but he applies "hydrogel" to the jelly-like mass formed by removal of the dispersion medium or by salt coagulation.

Hardy[7] recognized the difference in properties of substances called "gels" and he qualified the term—"gels by coagulation" and "gels by stiffening."

I feel confident that Graham did not apply this term as loosely as is popular at the present time. In his remarks on the properties of colloidal tungstic acid[8] he says: "It is remarkable that the purified acid is not pectized by acids or salts even at the boiling temperature. Evaporated to dryness, it forms vitreous scales, like gum or gelatine." Note that he describes the dry residue as "scales, like gum or gelatine" and not as gel.

It is evident, then, that the original meaning of the term gel has not been adhered to and in fact is more often applied to the state best described as jellies. Shall we adhere to Graham's definition or shall we discard it, restricting the term gel and its modifications to jellies, as popularity favors, and do away with any special terms to describe coagula from sols by electrolytes, or residues formed by evaporation to dryness? Special terms to describe these last two cases are obviously unnecessary and serve only to encumber colloid chemistry.

Lately the word "peptization" or "peptinization," as originated by Graham, has shown tendencies of wider use than formerly. Graham used this expression to describe the formation of a sol from a gel by the influence of a small amount of foreign reagent as, for example, the formation of a hydrous ferric oxide sol from a coagulum of ferric hydroxide by treatment with a small amount of hydrochloric acid or ferric chloride. He named it "peptization" because it resembled the hydrolysis of egg white to peptone by acid.

Cassuto, Hatschek, von Weimarn and Zsigmondy preserve the original sense of this term. Bancroft[9] has recently proposed, however, that we use peptization to describe all cases of transformation of gel (using this term in the present popular sense) to sol and not restrict it merely to cases where a foreign electrolyte has been added to accomplish the change. *E. g.*, when dry gelatine is "dissolved" in water Bancroft would call it a case of gelatine being peptized by water. This usage has its merits because it eliminates the word "dissolve" and the implication of "solution."

[2] "Die Kolloide Zustand der Materie."

[3] "Kolloide in Biologie und Medizin."

[4] "Kapillarchemie."

[5] "Introduction to the Physics and Chemistry of Colloids."

[6] "Chemistry of Colloids."

[7] *Z. physik. Chem.*, 33, 326; 385 (1900).

[8] *L. c.*, p. 340.

[9] *J. Phys. Chem.*, 20, 85–117 (1916).

Ostwald defines peptization as the phenomenon opposed to coagulation.

Taylor prefers a new term, "solation," which he applies to all cases of gel → sol transformations, and incidentally he urges the adoption of "gelation" to define all cases of sol → gel transformations instead of coagulation or pectization.

"Pectization," another of Graham's terms, is rapidly dying out. The word "coagulation" covers all cases of pectization and therefore why preserve an unnecessary term? Furthermore, why adopt the new term "gelation" proposed by Taylor. "Coagulation" is adequate. Of course, if it is decided to name jellies (stiffened sols) "gels," then the word "gelation" would be a good one to describe the "setting" of the gel or the stiffening of the sol.

Elimination of some synonymous terms is decidedly necessary from the list of names applied to the two more or less distinct classes or systems of colloid dispersions. For example, these two systems are variously named as follows:

Authors		
Noyes[10]	Colloidal solutions	Colloidal suspensions
Hardy,[11] Zsigmondy[12]	Reversible colloids	Irreversible colloids
Billitzer[13]	Baser colloids	Typical or genuine colloids
?	Hydrophilous colloids	Anhydrophilous colloids
Henri[14]	Stable colloids	Unstable colloids
Perrin, Freundlich,[15] Neumann[16]	Lyophilic colloids	Lyophobic colloids
Bary[17]	Dissolving colloids	Electrical colloids
Wo. Ostwald[18]	Emulsion colloids	Suspension colloids
von Weimarn[19]	Emulsoids	Suspensoids
Burton[20]	Gelatinizing type	Non-gelatinizing type

The terms "emulsoid" and "suspensoid" are very popular. "Lyophilic" and "lyophobic" are very expressive. The "stable-unstable" and the "reversible-irreversible" terms should be abolished, since they describe the conduct and changes in state of colloids when subjected to external conditions and are not always sharply defined. For example, hydrous ferric oxide sol is fairly stable in the presence of neutral electrolyte (much more so than colloidal gold or platinum), while it is irreversible when evaporated to *dryness*. Most writers classify it with the suspensoids, although Taylor calls it an emulsoid (since if it be evaporated *not quite* to dryness it is partially reversible). In reality it belongs to neither of these two generally accepted classes; its properties place it midway between the two, nearer the suspensoid than the emulsoid class. All the hydrous oxides of the basic or acidic elements act similar to hydrous ferric oxide.

On account of this confusion of classification Bancroft[21] has suggested that the distinction between these two groups be done away with. He prefers to classify colloidal systems according as to whether water or the more mobile phase, is the internal or the external phase and states: "While we are reasonably sure that colloidal gold is a solid and that colloidal oil is a liquid, the two behave exactly alike when both are suspended electrically."

This suggestion is along the proper lines, but is too sweeping, since colloidal gold and colloidal oil do not behave alike.

After a consideration of all the terms, it would seem that "lyophilic" and "lyophobic," or their more special derivatives, "hydrophobic" are the least objectionable terms, since most colloids answer to one of these designations. When our knowledge of colloids becomes exact enough to *sharply* differ-

[10] *J. Am. Chem. Soc.*, 27, 85 (1905).
[11] *Proc. Roy. Soc.*, 66, 95 (1900).
[12] "Kolloidchemie."
[13] *Z. physik. Chem.*, 45, 307 (1903).
[14] *Z. physik. Chem.*, 51, 29 (1905).
[15] "Kapillarchemie."
[16] *Koll. Z.*, 3, 80 (1908).
[17] *J. Chim. Phys.*, 10, 437 (1912).
[18] "Handbook of Colloid Chemistry."
[19] "Grundzüge der Dispersoidchemie."
[20] "Physical Properties of Colloidal Solutions."
[21] *J. Phys. Chem.*, 18, 549–558 (1914).

entiate between these two classes then we may find names for those systems which now seem to have properties which place them in neither of the above.

Before concluding, attention is directed to the irritating, although not very serious, mistake in the translations of the German terms "disperse" and "dispersions Mittel" by some authors. The German adjective "disperse" is "dispersed" in English, not "disperse," and "disperse Phase" is "dispersed phase," while "dispersions Mittel" is "dispersion medium" and not "dispersion means." These mistakes are like the old one of translating "Wanderung der Ionen" "wandering of the ions" instead of "migration of ions."

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ADDRESS AT THE FUNERAL SERVICES OF JOSEPH YOUNG BERGEN

I have known Mr. Bergen for nearly thirty years, and for a considerable time I was intimately associated with him in the authorship of a book, a text-book of physics. He did not begin his scientific work as a physicist; he began it as a chemist, and he did not end it as a physicist; he ended it as a botanist. But these changes in the subject of his labors, like the changes in his place of residence—from the middle west to New England, then to Italy, then back to New England—came from no fickleness of interest or infirmity of purpose. They were the result of certain hard conditions working on a man of extraordinary versatility, of extraordinary capacity, of extraordinary devotion to high ideals.

As a teacher he was not content merely to hold a place; he was receptive, active-minded, original; his alertness of observation, his catholicity of interest, his energy of imagination, enabled him to take the dry, dull matters of daily experience and kindle them into a source of illumination and vivifying power. As a writer of books he was not satisfied to give the public of his readers merely what it wanted. In physics and later in botany he took a large part in a great revolutionary movement affecting the teaching of science in all the secondary schools of this country, so that his name became familiar to all the progressive teachers of physics or teachers of botany throughout the land. And in those other writings, of a less formal character, in which he and Mrs. Bergen cooperated with perfect sympathy, there was a solidity of substance and a quality of form that commanded, I believe, the respect and the approval of profound scholars.

Nor was this all. What a fine, brave thing it was for a man of middle life, with an assured position as a teacher and with little financial assurance elsewhere, to give up this position and go to Italy, in order to pursue his scientific studies in their higher aspect, the aspect of original research, and to give his wife the physical conditions of life which she needed and for which she longed. And how finely, how bravely, he bore the care, the anxiety, the sorrow, that come to all of us in some measure and that came to him, it might seem, almost beyond measure.

With this character and this career, what manner of man did he seem to those who met and talked with him? I remember him vividly as I used to see him twenty-five years ago, the tall, spare, slightly bending figure, the long, swift, gliding stride, the abundant tawny hair and beard, the great brow jutting over the resolute, patient, illuminated face. And what was his manner of conversation? He talked freely and of many things, but not in commonplaces. It was not that he avoided commonplaces; they did not occur to him; he had not a commonplace mind. If one was in the mood to indulge in the ordinary gossip of the day, one was not in condition to sustain worthily a conversation with him.

But on one matter, one great matter, he never, so far as I can now recall, spoke to me. He was the son of a minister, and he once described to me with a certain grimness of humor some of the trials of a minister's family; but of religion, of religious faith or creed, he did not speak. He may have had a feeling, since I was a constant church-goer

and he was the contrary, that we should not be sufficiently in sympathy to discuss these matters with good feeling. I do not know how this may have been; but, speaking as one who, though subscribing to no formal religious creed, has a religious faith which is precious and a religious experience that is vital, I can not easily believe that our friend had nothing of these possessions. For the best evidence of something divine within ourselves and of something divine greater than our individual selves comes to us through affliction and sorrow borne with love; and this experience he had in full.

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SCIENTIFIC EVENTS

THE MEDALLISTS OF THE ROYAL SOCIETY

AT the anniversary meeting of the Royal Society on November 30, the president, Sir J. J. Thomson, conferred the medals of the society. The work of the recipients was thus characterized:

Copley Medal.—M. Emile Roux, Pasteur's chief collaborator, succeeded him as the director of the Institut Pasteur, which he has successfully developed and maintained as the foremost school of bacteriology, both for teaching and for research. From the early eighties, when he was associated with Pasteur and Chamberland in the study of anthrax and the production of vaccines against this disease, he has played a leading part in the development of our knowledge of the processes of immunity. His work with the distinguished veterinarian Nocard upon the contagious pleuro-pneumonia of cattle was the first demonstration of the existence of "ultra-microscopic," or, as they are now termed, filterable viruses as disease-producing agencies; his work with Yersin, the first full study of the bacillus of diphtheria and of its toxins. He shares with the late Professor Behring, of Marburg, in the introduction of diphtheria antitoxin as a practical means of prophylaxis and cure, and with him as cofounder of serum therapeutics was awarded the Nobel prize. All the leading French bacteriologists of our generation have been his pupils.

Royal Medals.—Dr. Aiken is distinguished for his lifelong researches on the nuclei of cloudy condensation, embodied in a series of memoirs communicated to the Royal Society of Edinburgh. The latest of these appeared in the present year. Dr. Aitken's discoveries opened up a new field of investigation in physics, and constitute a chapter of knowledge of great importance intrinsically and in their relation to the physics of meteorology. Dr. Aitken, who has pursued his work as an amateur, has displayed great experimental ingenuity, and his remarkable construction of the "dust-counter" has provided a permanent scientific appurtenance of precision to the physicist and climatologist. Among other contributions to science, Dr. Aitken has made important advances in our knowledge of the formation of dew.

Dr. Smith Woodward has been for many years keeper of the department of geology in the British Museum, and has published a very large number of valuable memoirs on fossil vertebrates, especially fishes. He has also published an important "Catalogue of Fossil Fishes in the British Museum," and his "Outlines of Vertebrate Paleontology," published in 1898, is a standard text-book on the subject. Dr. Smith Woodward's original memoirs are too numerous to mention, but they have secured for him a world-wide reputation, and he is universally regarded as one of the highest authorities on vertebrate paleontology.

Davy Medal.—M. Albin Haller, professor of organic chemistry at the Sorbonne, Paris, founder and first president of the International Association of Chemical Societies, and at the present time the most representative chemist of France, is distinguished for his many and important contributions to chemical science during the past forty years. His investigations have covered a very wide field in the domain of organic chemistry, the most important being those dealing with compounds belonging to the camphor group. He has maintained over a long period of years the reputation of the Sorbonne School of Chemical Research, created by Dumas and Wurtz, his predecessors in the chair.

Buchanan Medal.—Sir Almroth Edward Wright was the first (1896) to apply laboratory knowledge on typhoid immunity to the protection of human beings against enteric fever. Against formidable opposition he carried out a long series of observations with the highest scientific acumen and unsurpassed technique, and laid the foundations for the effective elimination of enteric fever from the armies of the world. Nothing of importance has been added to his work down to the present time.

Hughes Medal.—Professor C. G. Barkla's investigations have mainly dealt with X-rays, and

their absorption and secondary emission by solid substances. He showed that secondary emission of X-rays was of two varieties. In one of these the X-rays are scattered, without change of quality. The scattered rays were shown by examining tertiary emission to be polarized, and this was a fundamental result for the classification of X-rays with ordinary radiation, at that time doubtful. Professor Barkla's other kind of secondary emission is characteristic of the secondary radiator, and is accompanied by selective absorption of the primary rays. He showed that each chemical element emitted more than one definite kind of secondary fluorescent radiation. Concentrating attention on, say, the less penetrating kind, it was found to vary in quality by definite steps with the atomic weight of the secondary radiator.

REPORT OF THE YEAR'S WORK AT THE U. S. NAVAL OBSERVATORY

In his annual report to the Bureau of Navigation, Rear Admiral Howard, United States Navy, retired, superintendent of the Naval Observatory, says in part:

The time signals were sent out twice daily during the year, at noon and 10 P.M., seventy-fifth meridian time, both by land lines and by radio, through the operating relay at Radio, Va. The improvements mentioned in the last annual report have been completed and put in operation. The accuracy of the radio time signals, which can be picked up anywhere in the north Atlantic, has made it possible to reduce to one the allowance of chronometers for vessels of the Navy operating along the Atlantic coast.

The Naval Observatory has continued the policy of encouraging suggestions and developments of methods and instruments for navigation, particularly for submarines and aircraft.

The nautical-instrument repair shop has continued to prove economical in time and expense as compared with the previous system of having this work done by contract.

Owing to the great increase in ships of the Navy and the lack of receipt of materials and nautical instruments from abroad and the shortage of skilled labor in this country, especially in the manufacture of instruments and chronometers, the question of supply of instruments for navigation, especially chronometers, is becoming a matter of very serious proportions. The increased demand for the gyro-compass and the instruments attached to it is taxing the capacity of the only factory in this country which is able to manufacture this instrument.

Congress did not provide any addition to the clerical force, and it is earnestly recommended that the additional clerks which will be requested in the estimates to be submitted by the superintendent for the next fiscal year be approved and Congress urged to allow the same.

The scientific personnel has met twice each month, except during the summer, for the discussion of current astronomical topics and reading of papers by its members and scientists.

The astronomical work of this institution is now even more important than usual, owing to the European observatories losing many skilled observers due to the war.

Under the head of Aviation instruments and equipment, the report says:

As noted in the last annual report, the year started without any instruments or equipment for aviation, under the cognizance of the Bureau of Navigation, having been standardized.

Sets of clothing as used in the British and French aviation services were inspected at the observatory and at the aeronautic station at Pensacola, as well as sets manufactured by American firms. A board was appointed at Pensacola to specify a standard equipment and their report has been approved. The Bureau of Supplies and Accounts now has specifications for standard articles of clothing and personal equipment.

THE ENLISTMENT IN ENGINEER RESERVE CORPS OF TECHNICAL STUDENTS PENDING COMPLETION OF STUDIES

With the approval of the Secretary of War, Major General W. M. Black, chief of engineers, has promulgated regulations governing the creation of an Engineer Enlisted Reserve Corps, in which may be enrolled, pending completion of their studies, students of recognized technical schools. The announcement reads:

Under such regulations as the Chief of Engineers may prescribe a proportion of the students, as named by the school faculty, pursuing an engineering course in one of the approved technical engineering schools listed in the War Department, may enlist in the Enlisted Reserve Corps of the Engineer Department, and thereafter, upon presentation by the registrant to his local board of a certificate of enlistment, such certificate shall be filed with the questionnaire and the registrant shall be

placed in class V on the ground that he is in the military service of the United States.

In accordance with the authority given by this modification the following regulations are promulgated governing the enlistment by engineer students in the Engineer Enlisted Reserve Corps.

In order to be eligible for enlistment in the Engineer branch of the Enlisted Reserve Corps, under the above-quoted amendment to Selective Service Regulations, a candidate must fulfill the following conditions:

(*a*) He must be a citizen of the United States.

(*b*) He must be a student in one of the schools, the names of which are borne upon the list of technical schools approved by the Secretary of War for the purpose of carrying out section 5 of the river and harbor act approved February 27, 1911, relating to appointments from civil life to the grade of second lieutenant in the Corps of Engineers.

(*c*) He must be regularly enrolled and must be pursuing a course required for the degree of chemical engineer, civil engineer, electrical engineer, mechanical engineer, mining engineer, or some other equivalent engineering or technical degree.

(*d*) He must have made since his entry upon this course at the school a record of standing which will indicate clearly that he may be regarded fairly as deserving a place among the first third, based primarily on the scholastic records, of the young men who have graduated from that institution during the past ten years.

There follow forms of affidavits which are to be signed by the student and the president or dean of the school at which he is studying. The regulations continue:

In order to receive prompt consideration, applications from candidates now at college, and who are over twenty-one years of age, should be submitted so as to reach the office of the Chief of Engineers in Washington not later than January 15. The application from a person who has not reached this age at the present time must be submitted within three months before or one month after he reaches the age of twenty-one.

As rapidly as possible after the receipt of the applications in the Office of the Chief Engineers, they will be carefully examined, and the candidates whose applications are approved will promptly be sent cards of authorization, authorizing them to be enlisted in the Engineer Enlisted Reserve Corps by an office authorized to make enlistments in the Army, provided, of course, that they pass the necessary physical examination which will be made under the direction of the enlisting officer immediately prior to enlistment.

When thus enlisted the student's name will be placed on the "inactive list" of the Engineer Enlisted Reserve Corps, and he will be allowed to remain on this inactive list in order to enable him to complete his course at the institution.

Immediately after the completion of this course, or upon his discontinuance of the course for other reasons, the student will be given the option of being called into active service under his enlistment and being assigned to some one of the engineering branches of the Army, or of being immediately discharged and taking his place again among those subject to service under the draft.

SCIENTIFIC NOTES AND NEWS

THE War Department has established a Chemical Service Section and two lieutenant-colonels have been commissioned, Dr. Raymond F. Bacon, director of the Mellon Institute, Pittsburgh, to have charge of the chemical work in France, and Professor William H. Walker, of the Massachusetts Institute of Technology, to have charge of the work in the United States.

THE Perkin Medal Committee, consisting of members of the various chemical societies, has awarded the Perkin Medal for 1918 to Auguste J. Rossi of Niagara Falls, New York, in recognition of his work on titanium. The Perkin Medal was founded in 1906 by the New York Section of the Society of Chemical Industry to commemorate Sir William Perkin.

PROFESSOR A. RIGHI, professor of physics at Bologne, has been elected an honorary member of the British Institution of Electrical Engineers.

PROFESSOR T. B. WOOD, Drapers professor of agriculture in the University of Cambridge, has been appointed a member of the British Development Commission in succession to Mr. A. D. Hall, now secretary to the Board of Agriculture.

DR. ARTHUR KEITH, F.R.S., conservator of the Museum of the Royal College of Surgeons, has been appointed Fullerian professor of physiology in the Royal Institution.

Professor S. C. Prescott, of the department of biology and public health of the Massachusetts Institute of Technology, has been appointed to a commission as major in the food division of the Army Sanitary Corps.

Professor Charles P. Berkey, of Columbia University, as chairman of the committee on highways for the state of New York, has transmitted to the National Research Council a report on road materials and conditions controlling the construction of highways and other roads in New York.

Victor Yngve has been engaged as research chemist by the Oldbury Electro Chemical Company of Niagara Falls, N. Y., and will have charge of their research laboratory.

For the New Mexico Association for Science, officers for 1918 have been chosen as follows: *President,* Dr. John D. Clark, of the University of New Mexico; *vice-president,* J. E. Brownlee of the Normal School; *secretary,* Professor Higley of the Agricultural College; *treasurer,* Professor Goddard of the Agricultural College; members of the Educational Council, Paul A. F. Walter, for three years, Professor Rodgers of the Normal University for two years and Professor Barnes of the Agricultural College for one year.

Professor J. F. Adams, of Pennsylvania State College, is on leave of absence for a year and is spending the time at Columbia University and at the New York Botanical Garden. He is making a detailed study of a group of microscopic fungi, many of which occur as parasites on living plants.

Vilhjalmur Stefanssen, the Arctic explorer, last heard from in a letter received in March, 1916, has arrived with his party at Fort Yukon, according to word received by the naval department. Stefanssen, head of the Canadian Arctic Expedition has been in the far North since 1913 and lately there was some anxiety as to his safety.

Professor Wilder D. Bancroft, of Cornell University, lectured before the District of Columbia Chapter of the Sigma Xi on December 20, on Colloid Chemistry.

Professor R. D. Salisbury of the University of Chicago spoke on "Geography and geology work about Camp Grant," the National Army cantonment at Rockford in northern Illinois, at the Post-Vacation Luncheon of the Geographic Society at Chicago, on November 17.

At the request of the Medical Research Committee of Great Britain, Professor W. M. Bayliss last August visited various centers in France, to discuss with workers there special problems in the field and the application to them of methods devised in the laboratory. Acting upon suggestions made to it from France the committee appointed a special investigation committee for the purposes of further combined study of shock and the better correlation of laboratory and clinical observations. This committee consists of Professor F. A. Bainbridge, Professor W. M. Bayliss, F.R.S., Professor W. B. Cannon, Dr. H. H. Dale, F.R.S. (secretary), Lieutenant-Colonel T. R. Elliott, F.R.S., Captain John Fraser, Professor C. S. Sherrington, F.R.S., Professor E. H. Starling, F.R.S. (chairman), and Colonel Cuthbert Wallace, C.B. Professor W. B. Cannon, of Harvard University, whose work in this connection is of great value, is making arrangements for coordinating the work of this committee with that of a similar committee of American physiologists, and a further memorandum on the subject will probably be issued.

The Romanes lectures at the University of Oxford, which were not given in 1917, will next year be given by Mr. Asquith, lately premier, who is honorary fellow of Balliol College.

Portraits of the late Professor Raphael Meldola, painted by Mr. S. J. Solomon, were in December 18 presented to the Royal Society and to the Institute of Chemistry of Great Britain and Ireland.

Dr. Theodore Caldwell Janeway, since 1914 professor of medicine at the Johns Hopkins University and previously Bard professor of medicine at Columbia University, died on December 26 at his home in Baltimore

of pneumonia. Since the United States entered the war Dr. Janeway had been engaged in special research work for the government, being major in the Medical Officers' Reserve, on duty in Washington.

DR. HUGO SCHWEITZER, the industrial chemist, head of the Synthetic Patents Co., died on December 23 at his home in New York after a short illness from pneumonia. He was born in Germany in 1861 and came to this country in 1889.

PROFESSOR CLEMENT HENRY MCLEOD, professor of astronomy, surveying and geodesy, McGill University, in charge of the observatory, died on December 26, aged sixty-six years.

CHARLES HAWKSLEY, past president of the British Institution of Civil Engineers, died on November 27, aged eighty-seven years.

DR. A. M. W. DOWNING, formerly superintendent of the *Nautical Almanac,* died suddenly on December 8, at sixty-seven years of age.

DR. FRITZ DANIEL FRECH, professor of geology and paleontology in the University of Breslau, has died at the age of fifty-six years.

M. JOYEUX LAFFNIE, professor of zoology in the University of Caen, has died at the age of sixty-five years.

SURGEON GENERAL RUPERT BLUE, of the United States Public Health Service, has asked Congress to appropriate $300,000 for the purpose of establishing a Sanitary Reserve Corps, to combat outbreaks of disease in both times of war and times of peace. He also asked for appropriations to purchase quarantine stations at New York and Baltimore.

MR. HARRY PIERS, curator of the Provincial Museum at Halifax, has replied to an inquiry from Mr. Harlan I. Smith, regarding the relation of the explosion to the museum. The specimens and labels apparently came through fairly well, better than was expected, considering the unbelievably terrific and astonishingly loud explosion which demolished the Richmond section of Halifax, although windows were blown in, glass of cases smashed, a water pipe burst and snow stormed into one end of the building. Mr. Piers calls attention to the good results of always using water-proof ink for labels. The cases were boarded over soon after the explosion in order to use them as tables for Red Cross and other relief supplies, so that a careful examination of the damage has not been made. The publications probably have not suffered greatly. At the time of writing Mr. Piers had been too busy on relief work to examine into details of the museum.

MR. T. F. CLAXTON, director of the Royal Observatory, Hong-Kong, informs *Nature* that, in view of the world situation, it has been decided to discontinue sending the publications of the observatory to the United Kingdom, Europe and India during the war.

WE learn from *Nature* that a Linnean Society has been established recently in Sweden as "Svenska Linné-Sällskapet," intended as a means for spreading information about Sweden's greatest naturalist, Carl von Linné (1707–78). The society purposes to do this by publication of works by Linné and his pupils; to throw new light from modern viewpoints on Linné's personality; to draw up a catalogue of all known memorials, and to found a complete Linnean library. The president is Dr. Tycho Tullberg, a lineal descendant of Linné.

ACCORDING to the annual report of the chief of the Weather Bureau to the United States Secretary of Agriculture, a manual or handbook entitled "Meteorology and Aeronautics" will appear as Report No. 13 of the National Advisory Committee for Aeronautics. The handbook discusses the properties and general phenomena of the atmosphere which aeronauts and aviators should understand. It is divided into three parts: Part one, which deals with physical properties and dynamics of the atmosphere; part two, with topographic and climatic factors in relation to aeronautics, and part three, with current meteorology and its use. Part three also contains a summary of the free air conditions most likely to be experienced under different types of pressure distribution at the earth's surface. Frequent conferences have been held with officials of the

aeronautical branches of the Army and Navy, and plans are being perfected at several of the training camps for free-air observations in aid of aeronautics and the firing of projectiles. Copies may be obtained on application to the National Advisory Committee for Aeronautics, Washington, D. C.

Practically inexhaustible deposits of manganese dioxide, which is extremely valuable as an iron-toughening material and in great demand for war munition purposes, have been found in the Cypress Hill in South-East Albert, Canada. Eight hundred thousand tons, worth approximately £11,000,000, have been blocked out by ordinary post-hole augers in the last few months. The announcement is also made that the staff of the department of mining of the University of Toronto have discovered a process by which low-grade concentrates of molybdenite can be made at little cost. Molybdenite is used for hardening and toughening steel, and it is most useful in the manufacture of high-speed tools. Quebec is a larger producer, but the need for molybdenite is great, and the new process will, it is stated, render available the deposits of low-grade molybdenum ore which have been discovered in Manitoba and British Columbia.

It is stated in *Nature* that a report presented at the Newcastle meeting of the British Association last year directed attention to the lack of organization and general neglect of higher geodesy in the United Kingdom. The discussion upon this report led to the extension of the terms of reference of the committee so as to include, in addition to geodesy, other departments of geophysics, such as terrestrial magnetism, tides, atmospheric electricity and seismology. It was felt that steps should be taken to constitute a committee or association to promote the advance of the various branches of science which deal with the physical, metrical and dynamical properties of the earth, on both their theoretical and observational sides. Such a committee has now been appointed by the British Association and has arranged meetings for the discussion of geophysical subjects. The first meeting was held in the apartments of the Royal Astronomical Society on Wednesday, November 7, and will be presided over by the chairman of the committee, Sir Frank W. Dyson, the Astronomer Royal, who made a brief statement concerning the objects and future program of the meetings. The subject of magnetic surveys was introduced by Dr. S. Chapman, who made a report on magnetic surveys and charts by land and sea throughout the world. Dr. G. W. Walker gave an account of the recent magnetic survey of the United Kingdom made under the auspices of the Royal Society and the British Association. Major Lyons exhibited and described two of Gauss's heliotropes, on loan to the Science Museum. Among the subjects which the committee has under consideration for report and discussion at later meetings may be mentioned seiches and tides; atmospheric electricity; British earthquakes, observatories; methods and instruments in connection with the various branches of geophysics; geodetic and gravity surveys, and the constitution, temperature and other physical conditions, motions and secular changes of the interior of the earth.

According to the London *Times* the *Neue Zürcher Zeitung* recently published a review of German activities in technical matters in the field of war economics, in which it is stated that systematic investigations into the properties of pit coal have been carried on by the "Kaiser Wilhelm Institut für Kohlenforschung," and have yielded important industrial results. The treatment of coal with liquid sulphurous acid at ordinary temperatures has produced viscous, golden-yellow mineral oils, the amount produced being 5 kilogs, per metric ton. A process has also been elaborated by which through heating naphthalene under pressure, in the presence of aluminium chloride, an oil is produced which can be used for illuminating purposes in the same manner as petroleum. The utilization of lignite has been greatly extended. In the first place it is being used extensively as a fuel in the industrial establishments which have recently sprung up in the central German lignite fields, especially in the neighborhood of Bitterfeld and Halle a/S, where the

German air-nitrate factories are situated. A process has been discovered by which nearly twice the usual amount of ozokerite can be obtained from lignite, and the gas is being more extensively used for heating and smelting purposes.

Nature reports that one of the great captains of industry of Scotland has specially organized and equipped an engineering factory for the employment exclusively of educated women of good social standing instead of the usual woman factory worker, and with the fixed determination to carry on operations permanently under those conditions, the work to be taken up being that associated with the manufacture of internal-combustion motors. There is a fully illustrated account of the new factory in *Engineering* for November 9, from which it appears that it has some of the salient feature of a technical college combined with practical work in the factory, which gives that stimulus to study not realizable in the laboratory of a college. The factory is situated in the south of Scotland amidst beautiful scenery, so that students of botany and of wild-life generally can have full opportunity of pursuing their hobby. All the accessories which are now placed under the wide term "welfare" have been adopted to the fullest extent. Highly trained lecturers conduct classes at the works; these are compulsory. Entrants receive 20*s.* per week during the probationary period of six weeks; they then decide whether or not they intend to pursue the engineering career. If such be the case, and they are considered suitable, an apprenticeship agreement is entered into, and the wages become 25*s.* per week. Examinations are held at six months' intervals, and each "pass" means an increase of 5*s.* per week. It is evident that the whole scheme provides for women the opportunity of prosecuting an engineering career under the most favorable and stimulating conditions, and that the conditions are those best calculated for women of good education and social standing to attain a broad experience of engineering science and practise.

WE learn from the *British Medical Journal* that the Army Council has issued an instruction providing that students who at the time of their enlistment (whether they enlisted voluntarily or were called up under the military service acts) were actively engaged in medical studies and had completed the second year of their professional course, are, if eligible, and they so desire, to be transferred to the reserve, or discharged if ineligible for transfer to the reserve, for the purpose of resuming their studies with a view to obtaining a medical qualification. For the purpose of this instruction a man who had on or before enlistment completed two years of medical study, and who can within thirty-six months complete his professional curriculum and obtain his medical degree or license, is to be regarded as a third-year medical student. Students who do not pass the professional examination in anatomy and physiology within six months of resuming study will be recalled to the colors, and a student transferred to the reserve, unless he resumes his medical studies and enrolls in an Officers' Training Corps, will be recalled. Any third-year medical student who is desirous of being released from the colors under this instruction must apply through the usual channels, stating the date on which he desires to be released, and that he undertakes to resume his studies with a view to obtaining a medical qualification. A similar difficulty is being met in a different way in France. Owing to the prolongation of the war the supply of newly qualified men is drying up; casualties among medical officers have been numerous, the medical service in this respect coming next after the infantry. The French mobilization scheme provided that a medical student in a certain stage of the curriculum, reached usually at the end of the second year, should, when called up, be appointed médecin auxiliaire, a grade unknown in the Britsh army, but corresponding with that of surgeon probationer in the Royal Navy, which itself is the revival of the old grade of surgeon's mate. The case of medical students who have not advanced so far has recently engaged the attention of the Ministers of War and of Education, and of the General Staff, with the result that arrangements have been made by which medical students from the ranks may attend special courses of lectures

and eventually obtain credit for them when they seek a civil degree in medicine. Three schools of military medicine have been established for their benefit in regions behind the front, and have been duly provided with professors, libraries and laboratories.

UNIVERSITY AND EDUCATIONAL NEWS

Reaching a total of $515,436.09, federal grants of money to seventeen states under the Vocational Education Act were allotted at the meeting of the Federal Board of Vocational Education on December 21. Each of these states has complied with the terms of the law and has agreed to match every federal dollar with money publicly raised by the state or local community. The states are as follows: Alabama, Colorado, Florida, Iowa, Kansas, Michigan, Minnesota, Mississippi, Montana, Nebraska, North Carolina, Ohio, Oregon, South Dakota, Texas, Washington, Wyoming.

Accusations of disloyalty against five members of the faculty of the University of Illinois were found on December 11 to be without grounds, by a subcommittee in a report to the board of trustees of the institution.

Professor G. H. Scott, for fifteen years professor of mathematics and astronomy in Yankton College, Yankton, South Dakota, has resigned to become principal of Benzonia Academy, Benzonia, Michigan.

Francis W. Kirkham, of the Brigham Young University, has been chosen director of vocational education for Utah, following the laying of plans to bring the state under provisions of the Smith-Hughes act.

Dr. Wright A. Gardner, formerly associate professor of botany and plant physiologist at the Idaho University and Station, has been appointed plant physiologist and head of the department of botany at the Alabama College and Station.

DISCUSSION AND CORRESPONDENCE

A SUGGESTION FOR STAINING TECHNIQUE

Where one has many slides of sections passing through the various stages of dehydration and staining, a systematic method of labelling must be followed. Suggestions have been made to do this by means of a diamond point pencil or waterproof ink. Neither of these methods have worked satisfactorily for me—the first being too difficult to perform rapidly even after a good point has been procured and the marking being very difficult to read when covered with a dark stain. The second has these disadvantages and in addition the marking is very liable to rub off.

Therefore I suggest the following method which has worked satisfactorily for me while staining hundreds of sections at a time. Small aluminum clips with a numeral stamped or stencilled on each were prepared. These clips fasten on the edge of the slide when in the staining jars and are not large enough to prevent placing a cover on the jar. The data may be written in whatever manner desired in a notebook with the number or character to correspond to that on the aluminum clip. These clips are cheap, may easily be made and very few reagents ever used in dehydrations or staining attack the aluminum. The same clip may be used repeatedly.

Paul Ashley West

Toledo, Ohio

A NOTE ON THE PREPARATION OF SKELETONS BY BACTERIAL DIGESTION

The method of preparing skeletons by bacterial digestion is of long standing and has given excellent results. The present modification of the method was devised to obviate two objections which are of considerable importance when skeletons are prepared by students as class work. First, the digestion mass produces a foul odor and is disagreeable to handle, and, second, the digestion process, unless carefully controlled by frequent examinations is likely to result in displacement and subsequent loss of the smaller parts of the skeleton.

These objections are to a large extent overcome by embedding the roughly cleaned skeleton in a solid medium supporting bacterial growth. Agar-agar is preferable to gelatin, since it is not liquefied by the common bacterial enzymes. The method is as follows:

The skeleton of a freshly killed animal is more or less carefully cleaned of muscles and embedded in a plain agar solution (15 gm. per liter of water) which has been cooled to the pouring temperature (43° to 45° C.). The medium is allowed to solidify and the preparation is covered and set away at room temperature. The digestion requires from ten days to several weeks, depending largely on the extent of the preparatory cleaning. The time may be reduced by the use of incubator temperature. We have tried inoculating the skeletons with cultures of anaerobic proteolytic bacteria, but without great advantage.

The medium absorbs much of the odor and with suitably covered dishes it has been possible to leave the cultures standing in the laboratory. When the digestion is completed the bones can be conveniently dissected from the medium in their original relations. Washing the parts as removed completes the process. The skeletons thus prepared are very white, and bleaching is usually unnecessary. The method is best adapted to small skeletons, which can be embedded easily. It is these, however, which present the greatest liability to loss of parts in a fluid medium. The method promises to be particularly useful in the study of the cartilaginous skeletons of embryos.

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BIOLOGICAL LABORATORY,
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SHALL THE USE OF THE ASTRONOMICAL DAY BE DISCONTINUED?

TO THE EDITOR OF SCIENCE: The question has recently been raised in England whether the astronomical day should not be set back twelve hours, so as to begin at midnight instead of at noon. It is stated by those advocating the change that the practical consideration of those using the Nautical Almanacs should prevail as against the usage of astronomers. The opinion of American astronomers has been requested and a committee of the American Astronomical Society has been appointed to collect information for presentation at the next meeting of the Society.

The committee desires to obtain an expression of opinion on this subject from as large a number as possible of astronomers, geodesists, surveyors, navigators, and all others who have occasion to use Nautical Almanacs.

Communications may be sent direct to Professor W. S. Eichelberger, Director of the Nautical Almanac, U. S. Naval Observatory, Washington, D. C., or possibly better to some journal, where a public expression of opinion may stir up further discussion.

W. S. EICHELBERGER,
Chairman

SCIENTIFIC BOOKS

The Microscope. By SIMON HENRY GAGE, Professor of Histology and Embryology, Emeritus in Cornell University. The Comstock Publishing Company, 1917. Twelfth edition, 472 pages, 252 text figures.

This standard work is so well known to American students that extended comment upon its usefulness or upon its special merits is superfluous. The twelfth edition has been more extensively revised and rewritten than any one of the earlier ones. While many new things are presented, nothing has been considered which the author has not personally tested and found practical. Among the more important new devices described are: (1) the single objective binocular for both high and low powers; (2) improved apparatus for drawing with the projection microscope; (3) perfected ray filters which make it possible to get photomicrographs of almost any microscopic specimen; (4) the use of "daylight" glass in microscopical illumination, and (5) the dark field illumination for all powers which makes it possible to study living structures in much greater detail than heretofore. Some subjects treated in the previous edition, s ch as metallography and microchemistry, v nich are now presented adequately in other available works, have been omitted. Because of its clearness and accuracy of statement, its well-chosen material, and its wealth of information, the book will without doubt continue to be the most widely used volume on the microscope in American laboratories.

M. F. GUYER

Introduction to Rural Sociology. By Paul L. Vogt. D. Appleton and Co., New York. 1917.

This book was written primarily as a text for college students interested in the social problems of small communities. The subject matter is what one would expect in such a book. The physical basis of rural life; the rural population, its movements, its health and its attitudes of mind; farmers' organizations, both social and economic; the established institutions dealing with country life, *e. g.*, the church and the school; and the relation of the village to the open country are the principal topics discussed.

Throughout the book it is very apparent that the author has been at great pains to make his work as accurate and comprehensive as possible. In both respects he has succeeded admirably, and that, too, without becoming tedious. In fact, I think the combination of the essentials of a text with a pleasing exposition will recommend the book to a rather large circle of readers outside of the class room.

A feature of the book especially worthy of notice is the thorough discussion of the relation of the village to the life of the open country. The author fully realizes that there can be no satisfactory development of agencies for the betterment of rural life unless village and farm cooperate and he has expressed this view clearly and convincingly.

No doubt reviewers will always feel that sins of omission are frequent. I am happy to say they are but few in the work under discussion. To my mind the most important omission is the failure to discuss the eugenic problems of the rural population and to give more attention to the natural movements of population due to the varying birth rates and death rates in different groups and in different sections of the nation.

In the numerous suggestions for the improvement of rural life occurring in almost every chapter the author shows sound practical sense. He knows rural communities at first hand. He knows their prejudices, their apathy, their strength and their weaknesses. One feels that the spirit of the writer would go far towards allaying the suspicion and the hostility so often encountered by those who would help to make the rural community a better place to live.

Warren S. Thompson
University of Michigan

SPECIAL ARTICLES

NOTE ON A WET CONDENSER SUITABLE FOR CONTINUOUS HIGH POTENTIAL SERVICE

In certain investigations necessitating long continuous production of a fat spark by means of a closed circuit transformer (1 K.W., 110 v. primary, 11,000 v. secondary) it was found that the glass plate condensers usually provided for this purpose repeatedly broke down owing to the heating under continuous performance. It occurred to us to substitute the ordinary glass with some glass having greater heat-resisting properties.

One liter, tall form, lipless "Pyrex" beakers were accordingly covered with tinfoil as carefully as possible, both on the inner and outer surfaces. These were then mounted by placing the edge into a groove in a board and sealing in with rosin. Condensers of this kind were tedious to make, and proved quite a problem to mount securely. The labor involved in producing a set of the required capacity stopped work in this direction.

The final form of condenser which has proved very serviceable for the work in hand was that in which the "Pyrex" glass beakers mentioned above constituted the dialectric, and a nearly saturated solution of common salt constituted the conductor plates. The beakers were filled to within 2.5 cm. of the rim with the solution, and were immersed to a similar depth into the solution contained in an earthen vessel, a 3 gallon crock. The beakers measure 9 cm. in diameter, 19 cm. high, 16.5 cm. effective height, thickness, about 1.2 mm. The twenty beakers used were selected from a stock of about 100 in order to avoid flaws, particularly bubbles. The stock was a little old and therefore probably not as good in evenness of surface and homogeneity of material as that now being manufactured. It was not pos-

sible to avoid such defects entirely, but it is interesting to note that no beaker has proved defective after very long and severe use.

The place subjected to greatest danger of puncture and that which allows greatest leakage is where the exposed surfaces of the solution inside and out come in contact with the surface of the beakers. This defect can be reduced considerably by filling the beakers with the salt solution to a slightly different level from that of their containers. Care should be taken not to wet the portion of the beaker that is not immersed. To eliminate sparking quite completely, however, the surfaces of the solution inside the beakers and that surrounding the beakers were covered with a layer of oil 5 cm. deep. For this purpose a 300-degree mineral seal oil was used. This oil, as Mr. C. E. Skinner kindly informed us, has very good dialectric properties—as good as can be expected from an oil not free from water. Whether this layer of oil eliminated sparking at the sacrifice of some capacity we have not determined.

The capacity of these condensers was estimated by the method of divided discharge and by the method of mixtures. The capacity of each of the five jars containing four beakers each was: .0088 M.F., .0091 M.F., .0093 M.F., .010 M.F., .0088 M.F. respectively. The mean of these capacities is .0092 M.F. A similar estimation of the capacity of two such beakers covered with tinfoil indicated that their combined capacity was very appreciably less than two beakers of the wet condenser. This is probably due to the unevenness of the surface and the difficulty of making contact between the glass and the tinfoil.

A comparison was made between the wet condenser as above described in which beakers of Jena glass and of "Pyrex" glass were used. The dimensions of these beakers were approximately the same. Assuming that the average thickness of the "Pyrex" beaker is equal to that of the Jena and assuming the dielectric constant of Jena glass to be 6.5, that of "Pyrex" glass must be about 4.3.

A comparison was also made as to the influence of the character of the conducting medium. Beaker condensers were set up using mercury, concentrated salt solution and distilled water (iron still), respectively. The capacities of the latter two were equal within the limits of error of measurements, while the capacity when using mercury was 10 per cent. higher than when using the salt solution. The slight superiority of mercury at low constant potential seems to be very greatly enhanced at the high and discontinuous potentials employed to produce the spark, where, judging by the fatness of the spark, the capacity of the condenser with mercury is three or four times as great as that of the condenser with salt solution.

This wet condenser has given perfect satisfaction under severe use for many months. Its cost is approximately the same as the glass plate condenser and considerably less than similar condensers covered with tinfoil.

E. KARRER,
H. S. NEWCOMER
THE PHYSICAL LABORATORY OF THE
UNITED GAS IMPROVEMENT COMPANY,
THE LABORATORY OF THE HENRY PHIPPS
INSTITUTE OF THE UNIVERSITY OF
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BOSTON MEETING OF THE AMERICAN CHEMICAL SOCIETY. VI

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

H. E. Howe, *Chairman.*

S. H. Salisbury, Jr., *Secretary.*

Conference on "The Industrial Chemist in War Time"

The cracking of solvent naphtha in the presence of Blau gas: GUSTAV EGLOFF. Solvent naphtha derived from the thermal decomposition of coal was passed through a carburetted water gas set in the presence of Blau gas at a temperature of 850° C. to produce toluene. The solvent naphtha used gave a distillation range of 93 per cent. between 130° C. and 165° C. First drop at 128° C. and dry at 183° C. Distillation determined by means of a 100 c.c. Standard Engler flask. The percentage yield of toluene in the recovered oil was nineteen, and upon the basis of solvent naphtha used eleven and one half per cent.

The effect of pressure upon the formation of benzene and toluene from gas oil: Gustav Egloff. Gas oil derived from a Pennsylvania crude petroleum was subjected to pressures of one, eleven and eighteen atmospheres at constant temperature of 700° C. to form benzene and toluene. The following table tabulates the analytical data:

700 deg. C.

Atmospheres Pressure	One	Eleven	Eighteen
Specific gravity recovered oil ..	0.891	0.970	0.998
Per cent. of recovered oil	13.3	25.0	18.0
Per cent. benzene in recovered oil	11.3	22.3	22.4
Per cent. of toluene in recovered oil	7.5	15.1	12.9
Per cent. of benzene on basis oil used for production	1.5	5.6	4.1
Per cent. of toluene on basis of oil used for production.....	1.0	3.8	2.3

An experiment in scrubbing carburetted water gas from recovering aromatics: Robert J. Moore and Gustav Egloff. The following tables cover the percentages of benzene, toluene and xylene obtained by scrubbing one thousand cubic feet of carburetted water gas, using a paraffin "straw" oil as absorbent medium.

PERCENTAGES OF BENZENE, TOLUENE, XYLENE AND UNSATURATEDS IN LIGHT OIL OBTAINED

Cut Deg. C.	Per Cent. by Vol.	Spec. Grav.	Per Cent. Unsat.
Benzene (to 95).....	51.8	0.866	46.0
Toluene (95 to 120)..	24.1	0.869	18.0
Xylene (120 to 150) .	6.0	0.868	24.0

AROMATICS RECOVERABLE FROM 1,000 CU. FT. OF GAS

	Liters	Gallons
Benzene	0.267	0.0707
Toluene	0.242	0.0640
Xylene	0.062	0.0163

In view of the fact that the annual production of carburetted water gas is in the neighborhood of 150 billion cubic feet the above figures assume an added significance.

Deposition of silver films on glass: Alexander Silver and Raymond M. Howe. A paper dealing with the study of various reactions involved in depositing silver films on glass from ammoniacal silver solutions by the use of aldehydes in the presence of alcohols and sugars. By modifying the old Liebig method it is found possible to produce perfect silver films on glass through the introduction of alcohols and sugars, the mirrors forming in the cold. The rate of deposition is controllable. The cost of mirror production is lowered considerably and the efficiency of the process as developed is higher than that of any of the older methods in use.

Some notes on chars and other solid decolorizing agents: Charles E. Wood. The decolorizing effects on sugar solutions of bone char, animal and vegetable chars and several other kinds of carbon, including lamp black and aquadag are compared with one another and with fuller's earth and clay. A brief statement as to optimum conditions of manufacture and use is given and a few theoretical considerations are brought together.

Comparative tests of porcelain laboratory ware: C. E. Waters. Five kinds, which were all that could be obtained, were tested: two American, two German and one Japanese. One German and the two American wares did not stand up well when heated to 225° C. and quickly cooled by floating on water at room temperature, or when suddenly heated in the flame of a Fletcher burner. There was not only actual breakage, but in many cases the glaze cracked under the tongs when a hot piece was picked up. The solubilities in hot solutions of sodium hydroxide and carbonate, in nearly boiling concentrated sulphuric acid, in fused sodium nitrate and in a fused mixture of this salt and the carbonate, were comparatively slight. In this respect there is little choice between the five brands. Ferric oxide, when ignited in a thin layer over the bottom of the dish, stained the glaze, but was readily removed by digestion with hydrochloric acid. The loss in weight under this treatment was so small that there could have been little or no formation of an easily soluble silicate.

Comparative tests of chemical glassware: Percy H. Walker and F. W. Smither. Composition, coefficient of expansion, refractive indices, condition of strain, effect of heat and mechanical shock and resistance to various chemical reagents were determined on seven kinds of glassware, which bear permanent manufacturers' trade-marks, and which are offered for sale on the American market. Two of these kinds of glass were of foreign manufacture. The tests, which were intended to furnish information as to the relative values of the different makes of glass for laboratory operations, show that the five kinds of American-made ware are distinctly superior to one of the foreign brands and at least equal to the other foreign brand.